DOCUMENT RESUME

ED 433 660 EC 307 405

AUTHOR Kornhaber, L.; Kathirithamby, R.; Cohen, H. J.
TITLE The Use of Neuromuscular Electrical Stimulation as Part of a Program of Supports To Improve Gait in a Child with Cerebral Palsy and Severe Mental Retardation--A Case Study.
PUB DATE 1999-05-00
NOTE 8p.; Paper Presented at the Annual Meeting of the American Association on Mental Retardation (123rd, New Orleans, LA, May 24-28, 1999).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Assistive Devices (for Disabled); Case Studies; *Cerebral Palsy; Children; *Electrical Stimuli; *Mobility Aids; Motor Development; *Motor Reactions; *Outcomes of Treatment; *Severe Mental Retardation
IDENTIFIERS *Neuromuscular Skills

ABSTRACT

A case study of a 10-year-old boy with cerebral palsy and severe mental retardation investigated whether he would be able to: (1) benefit from a program of supports which includes neuromuscular electrical stimulation (NMES) with intensity sufficient to achieve a tetanic muscle contraction, (2) participate in a weekly program, using NMES, in a task-oriented model of motor learning, and (3) use NMES to achieve the functional outcome of ambulation with foot flat and knees fully extended while wearing floor reaction orthoses and using an assistive device. Reusable self-adhering electrodes were applied to the quadriceps muscles of both legs. The subject then participated in task-oriented motor activities. The treatment was continued for 45 minutes, 20-30 minutes of which included NMES. Results found the intensity of NMES necessary to produce tetanic muscle contraction was achieved after five treatments. The subject was able to participate in a weekly program using NMES in a task-oriented model of motor learning, however, he was not able to achieve foot flat with full knee extension in standing or gait. Treatment was terminated when an orthopedic consult resulted in a team decision to perform bilateral soft tissue releases on the subject's hamstrings. (CR)

THE USE OF NEUROMUSCULAR ELECTRICAL STIMULATION AS PART OF A PROGRAM OF SUPPORTS TO IMPROVE GAIT IN A CHILD WITH CEREBRAL PALSY AND SEVERE MENTAL RETARDATION – A CASE STUDY

BY

L. KORNHABER, R. KATHIRITHAMBY, & H. J. COHEN

The Use of Neuromuscular Electrical Stimulation As Part of a Program of Supports to Improve Gait in A Child With Cerebral Palsy and Severe Mental Retardation - A Case Study

L. Kornhaber, R. Kathirithamby, H. J. Cohen
Children's Evaluation and Rehabilitation Center, Rose F. Kennedy UAP,
Albert Einstein College of Medicine, Bronx, NY

Children with cerebral palsy (CP) often display gait deviations, which impair their mobility and which cannot always be successfully addressed by traditional therapies. Neuromuscular electrical stimulation (NMES) is currently being introduced as a modality for physical therapists to reduce gait deviations in children with CP. In the few reports of the use of NMES in children, success was reported in children who were able to participate reliably in directed play activities. No reports were found of the use of NMES in children with severe mental retardation (MR) who might respond atypically to a new sensory stimulus.

Case

J. is a 10-year-old child with a diagnosis of CP and severe MR. He is atypically reactive to sensory stimuli and displays generalized spasticity. Range of motion is within functional limits. Floor reaction ankle-foot orthoses were prescribed to maintain neutral alignment at the knees and ankles in weight bearing. In the orthoses he was unable to assume foot flat, continuing to take weight on his toes with hip and knee flexion. Exercises to improve his standing posture were not fully successful. J. had begun ambulating short distances in his AFO's using a posterior Wenzelite walker, at school. At home his primary means of mobility was quadruped creeping and knee walking.

Objectives

(1) To determine if a latency age child with CP, severe MR and atypical responses to stimuli is able to benefit from a program of supports which includes NMES with intensity sufficient to achieve a tetanic muscle contraction.

(2) To determine if a latency age child with severe MR and CP is able to participate in a weekly program using NMES in a task oriented model of motor learning.

(3) To determine if such a program is effective to achieve the functional outcome of ambulation with foot flat and knees fully extended while wearing floor reaction orthoses and using an assisitive device.

Method

A small, portable Respond II unit was used. Reusable self-adhering electrodes were applied to the quadriceps muscles of both legs. J. then participated in task oriented motor activities. The treatment was continued for 45 minutes, 20-30 minutes of which included NMES.

Results

(1) The intensity of NMES necessary to produce tetanic muscle contraction was achieved after five treatments. J. indicated awareness of the stimulation by glancing at his legs as the unit cycled on. He would also occasionally initiate bouncing or sit to stand from a bench as the stimulation was introduced. He became briefly upset only when electrodes were placed and removed.

(2) J. was able to participate in a weekly program using NMES in a task oriented model of motor learning. His mother reports increased endurance for ambulation in school using a posterior rolling walker. At home she reports he now is able to pull to stand. In treatment he displays increased endurance and more willingness to stand for play.

(3) J. was not able to achieve foot flat with full knee extension in standing or gait. The use of his orthoses did not appear to influence knee position. Treatment was terminated when an orthopedic consult resulted in a team decision to perform bilateral soft tissue releases on J.'s hamstrings.

Discussion

J. was difficult to consistently engage in tasks involving activation of hip and knee extension in weight bearing, which were the necessary motor skills required to achieve the goal of standing with foot flat and knees fully extended. In repeated treatments his motivation varied with similar play activities and environmental constraints.

Variables which may have affected the outcome:

Attendance: secondary to illness, conflicting appointments and family obligations J. was not able to attend consistent weekly appointments.

Compliance: decreased use of night splinting consisting of bilateral knee immobilizers in conjunction with bilateral ankle-foot orthoses

Variability with
- motivation to engage in goal directed activities.
- emotional responses to play.
- ability to relate to therapist.
-reactions, possibly atypical, to sensory stimuli.

In conclusion, it is suggested that J.'s cognitive function was less important to the outcome than these variables.

Description of Equipment and Parameters Used

Respond Select
Dual Channel Neuromuscular Electrical Stimulator

reusable, self-adhering, pregelled electrodes

pulse rate - initially set at 1 pulse per second to allow the child to accommodate to stimulation, then increased to 35 pps to achieve tetanic contraction

ramp or rise - set at 4 seconds for greatest comfort

on-off time - initially set for 5/10, for a total time of 20 minutes for comfort and to avoid undue fatigue; increased to 10/15 for 30 minutes as endurance increased

intensity was determined by J.'s indications of discomfort

The Use of Neuromuscular Electrical Stimulation As Part of a Program of Supports to Improve Gait in A Child With Cerebral Palsy and Severe Mental Retardation - A Case Study

L. Kornhaber, R. Kathirithamby, H. J. Cohen
Children's Evaluation and Rehabilitation Center, Rose F. Kennedy UAP,
Albert Einstein College of Medicine, Bronx, NY

Children with cerebral palsy (CP) often display gait deviations, which impair their mobility and which cannot always be successfully addressed by traditional therapies. Neuromuscular electrical stimulation (NMES) is currently being introduced as a modality for physical therapists to reduce gait deviations in children with CP. In the few reports of the use of NMES in children, success was reported in children who were able to participate reliably in directed play activities. No reports were found of the use of NMES in children with severe mental retardation (MR) who might respond atypically to a new sensory stimulus.

Case

J. is a 10-year-old child with a diagnosis of CP and severe MR. He is atypically reactive to sensory stimuli and displays generalized spasticity. Range of motion is within functional limits. Floor reaction ankle-foot orthoses were prescribed to maintain neutral alignment at the knees and ankles in weight bearing. In the orthoses he was unable to assume foot flat, continuing to take weight on his toes with hip and knee flexion. Exercises to improve his standing posture were not fully successful. J. had begun ambulating short distances in his AFO's using a posterior Wenzelite walker, at school. At home his primary means of mobility was quadruped creeping and knee walking.

Objectives

(1) To determine if a latency age child with CP, severe MR and atypical responses to stimuli is able to benefit from a program of supports which includes NMES with intensity sufficient to achieve a tetanic muscle contraction.

(2) To determine if a latency age child with severe MR and CP is able to participate in a weekly program using NMES in a task oriented model of motor learning.

(3) To determine if such a program is effective to achieve the functional outcome of ambulation with foot flat and knees fully extended while wearing floor reaction orthoses and using an assisitive device.

Method

A small, portable Respond II unit was used. Reusable self-adhering electrodes were applied to the quadriceps muscles of both legs. J. then participated in task oriented motor activities. The treatment was continued for 45 minutes, 20-30 minutes of which included NMES.

Results

(1) The intensity of NMES necessary to produce tetanic muscle contraction was achieved after five treatments. J. indicated awareness of the stimulation by glancing at his legs as the unit cycled on. He would also occasionally initiate bouncing or sit to stand from a bench as the stimulation was introduced. He became briefly upset only when electrodes were placed and removed.

(2) J. was able to participate in a weekly program using NMES in a task oriented model of motor learning. His mother reports increased endurance for ambulation in school using a posterior rolling walker. At home she reports he now is able to pull to stand. In treatment he displays increased endurance and more willingness to stand for play.

(3) J. was not able to achieve foot flat with full knee extension in standing or gait. The use of his orthoses did not appear to influence knee position. Treatment was terminated when an orthopedic consult resulted in a team decision to perform bilateral soft tissue releases on J.'s hamstrings.

Discussion

J. was difficult to consistently engage in tasks involving activation of hip and knee extension in weight bearing, which were the necessary motor skills required to achieve the goal of standing with foot flat and knees fully extended. In repeated treatments his motivation varied with similar play activities and environmental constraints.

Variables which may have affected the outcome:

Attendance: secondary to illness, conflicting appointments and family obligations J. was not able to attend consistent weekly appointments.

Compliance: decreased use of night splinting consisting of bilateral knee immobilizers in conjunction with bilateral ankle-foot orthoses

Variability with
- motivation to engage in goal directed activities.
- emotional responses to play.
- ability to relate to therapist.
-reactions, possibly atypical, to sensory stimuli.

In conclusion, it is suggested that J.'s cognitive function was less important to the outcome than these variables.

Description of Equipment and Parameters Used

Respond Select
Dual Channel Neuromuscular Electrical Stimulator

reusable, self-adhering, pregelled electrodes

pulse rate - initially set at 1 pulse per second to allow the child to accommodate to stimulation, then increased to 35 pps to achieve tetanic contraction

ramp or rise - set at 4 seconds for greatest comfort

on-off time - initially set for 5/10, for a total time of 20 minutes for comfort and to avoid undue fatigue; increased to 10/15 for 30 minutes as endurance increased

intensity was determined by J.'s indications of discomfort

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: The Use of Neuromuscular Electrical Stimulation As Part of a Program of Supports to Improve Gait in a Child With Cerebral Palsy and Severe Mental Retardation - A Case Study

Author(s): L. Kornhaber, R. Kathirithamby, H.J. Cohen

~~Corporate~~ Source: Children's Evaluation and Rehabilitation Center
Rose F. Kennedy UAP
Albert Einstein College of Medicine, Bronx NY

Publication Date: 5/99

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1	Level 2A	Level 2B
☑	☐	☐
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) *and* paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature: L. Kornhaber	Printed Name/Position/Title: Lillian Kornhaber PT
Organization/Address: CERC, RF Kennedy Center 1410 Pelham Parkway South Bronx NY 10461	Telephone: 718-430-8600 x6406 FAX: 718-892-2256 E-Mail Address: Date: 8/23/99

(over)

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

ERIC CLEARINGHOUSE ON DISABILITIES
AND GIFTED EDUCATION
THE COUNCIL FOR EXCEPTIONAL CHILDREN
1920 ASSOCIATION DRIVE
RESTON, VIRGINIA ~~22091~~-1589
20191

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
1100 West Street, 2nd Floor
Laurel, Maryland 20707-3598

Telephone: 301-497-4080
Toll Free: 800-799-3742
FAX: 301-953-0263
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com